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Defense Seismologist Denies Allegations of Geophysical-Warfare R&D

917N0167 Moscow KOMSOMOLSKAYA PRAVDA in English 1 Aug 91 p 4

[Abstract] A letter from General-Major V. Bocharov, a doctor of technical sciences and professor, is published with editorial comments. Bocharov, who is identified as the chief seismologist of the USSR Ministry of Defense (Minoborony), responds to earlier KOMSOMOLSKAYA PRAVDA articles about studies of artificial initiation of earthquakes and possible military applications of this research. He rebukes the newspaper's correspondents for distorting findings of A. Nikolayev, corresponding member of the USSR Academy of Sciences, in particular. Bocharov specifically accuses KOMSOMOLSKAYA PRAVDA correspondent S. Sokolov of misquoting him in regard to the shutdown of a Minoborony project for studying the feasibility of developing so-called tectonic or geophysical weapons. No such project has ever existed, according to Bocharov. On the basis of an analysis of scientific periodicals and of data which he himself has gathered, Bocharov contends that underground nuclear explosions have no effect on the generation of intense earthquakes.

In the editorial commentary, it is pointed out that Bocharov's letter fails to refute evidence of a possible connection between underground nuclear explosions and the Gazli earthquakes of 1976 and 1984, which was mentioned in an earlier article. (See the DAILY SNAP, 28 June 1991, p 1, col. 2). The heads of the USSR Academy of Sciences are praised for submitting the question of geophysical-weapons R&D to open discussion, and military scientists are called upon to study the problem of defending against such weapons.

Spatial Compensation of Natural Geomagnetic Background in Active Electromagnetic Sounding of Earth

927N0002A Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 318 No 5, Jun 91 pp 1137-1139

[Article by V. A. Morozov, L. T. Remizov, A. V. Elbakidze, A. N. Boguslavskiy and S. P. Kharchenko, Radio Engineering and Electronics Institute, USSR Academy of Sciences, Fryazino, Moscow Oblast]

UDC 551

[Abstract] Short-period pulsations (SPP) of the magnetic field, frequently considerably exceeding the internal noise of modern detectors, constitute the principal type of additive noise in active electromagnetic sounding in the range of periods greater than 1 s. A study was made of the suppression of such noise in the SPP range with a period 1-100 s by the adaptive compensation of noise in a system of spaced measuring points. The range 1-100 s takes in the extremely informative sector of the spectrum of signals from an artificially generated field when exploring for oil and gas in a stratum of the upper relatively well-conducting sedimentary layer in the northern Caspian Basin. The basis for the method is the concept of an initial geomagnetic background approximately uniform along the length of a field point-base point measurement line. The geomagnetic background is distorted by the reaction of local inhomogeneities of the geoelectric section in a horizontal direction. The results presented in the article were obtained by compensation methods for the case of an unknown horizontal structure of the underlying medium. Due to such an inhomogeneity the spectral relations of the field components at the field points are a priori unknown and may vary significantly in the frequency range of concern. This is illustrated in the specific example of data registered in the Astrakhan oil and gas region. The intensity spectra of the compensable component of the noise field before and after compensation are analyzed, as well as the results of compensation in the time region in comparison with simple noise accumulation in the repetition periods of the sounding signal. The findings apply only to the magnetic component; compensation for the electrical components of the magnetotelluric field requires separate examination. Figures 2; references 7: 5 Russian, 2 Western.

Participant of Nuclear Tests Refutes Rumored Connection With Earthquake

917N0133 KRASNAYA ZVEZDA in English, 14 May 91 p 4

[Article by Falichev, O., Lieutenant-Colonel (interviewer)]

[Extract] Our correspondent met with General-Major V. Bocharov, a leading seismology expert of the USSR Ministry of Defense, and requested him to answer a number of questions. Bocharov is a doctor of technical sciences, a professor and a laureate of the USSR State Prize.

"Vladimir Semenovich, rumors are stirring in Georgia that military personnel gave rise to the earthquake. Is there any connection between underground nuclear tests and earthquakes?"

"No such connection has been confirmed by observations of either Soviet scientists or scientists of the United States, with many of whom I am acquainted. The density of earthquakes was checked prior to tests of nuclear weapons, during our moratorium of a year and a half, and after it. What scientists call the flow density of earthquakes remained what it was previously. The number of major earthquakes also did not change.

"There could not have been any accidental explosions, either. I served as a member of a group for monitoring the conduct of underground nuclear tests, and I know the sensitivity of equipment which both we and the Americans have for recording the slightest earth tremors. To conceal them is simply impossible. To say that Soviet military personnel possess technology for stirring up

earthquakes is simply absurd. Neither the seismic service of the USSR Ministry of Defense nor the USSR Academy of Sciences managed to record any seismic sources in the Caucasus area during the period immediately preceding the earthquake, although we record explosions even in kiloton units in Nevada, i.e., on the other side of the globe."

"Speaking on television, the president of Georgia said that the military could use superpowerful 'geophysical' weapons. What can you say in this regard?"

"As far as I know, no work on geophysical weapons is in progress in the Ministry of Defense. To develop such weapons would make no sense at all; all of the Earth's territory, including that of our own country, is zoned for intensity of earthquakes. Quakes more intense than five points will not occur in the plains, for example. Geophysical weapons are senseless also because they are easily parried by normal construction.

"An earthquake also cannot be provoked from space of by any other methods."

Generation of Spatial Internal Waves in Rotating Ocean by Nonstationary Disturbances

927N0001A Kiev MORSKOY GIDROFIZICHESKIY ZHURNAL in Russian No 4, Jul-Aug 91 pp 22-28

[Article by S. F. Dotsenko and V. M. Savoskin, Marine Hydrophysical Institute, Ukrainian Academy of Sciences, Sevastopol]

UDC 551.466.81

[Abstract] A study was made of possible types of wave fields in an ocean with a constant Vaisala-Brunt frequency. The wave regimes for individual modes of internal and gyroscopic waves were classified on the basis of asymptotic evaluations of the integrals. A region of pressures, harmonic in time, uniformly moving over the surface of a continuously stratified rotating ocean of constant depth, generates surface, internal and gyroscopic waves. They attenuate with increasing distance from the generation zone in conformity to the law $R^{-1/2}$ and exist with all speeds of movement and frequencies of oscillations of the external disturbance. Surface and internal or surface and gyroscopic waves are generated in an ocean with a uniform density stratification. The second case occurs due to the Earth's rotation and is possible in a uniform ocean of finite depth. With the generation of internal or gyroscopic waves in a uniformly stratified ocean for each vertical mode there are six qualitatively different wave regimes. Two of these correspond to subinertial periods of oscillations of the external disturbance and therefore are possible only in a rotating ocean. For each vertical mode the field of induced waves is formed by four-six spatial systems of progressive waves localized in definite angular regions and exhibit nonidentical spatial development. There are such parameters of the problem in which the waves are generated in front of a moving disturbance. There is a correspondence between the spatial structures of the fields of internal and gyroscopic waves. Figures 3; references 15: 12 Russian, 3 Western.

Evaluating Influence of Bottom Relief and Mean Currents on Parameters of Shelf Waves

927N0007D Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 6, Jun 91 pp 674-676

[Article by V. A. Ivanov and A. Ye. Yankovskiy, Marine Hydrophysics Institute, Ukrainian Academy of Sciences]

UDC 551.466.5

[Abstract] The influence of bottom relief and an aperiodic mean current on the spatial-temporal parameters of shelf waves near the critical frequency is investigated in the example of the Black Sea. It is assumed that an aperiodic mean current propagates along the isobaths over the continental slope and is described by the function $V_0(x)$. A solution is sought in the form of waves propagating along the shore and harmonic in the y-coordinate. The influence of bottom relief is evaluated assuming $V_0(x) = 0$. Computations with use of depth profiles were made for determining the contribution of different relief sectors, as well as the region of the ocean where depth is constant. Within the limits of the shelf and continental slope depth increases linearly and the bottom slope increases in a jump at the edge of the shelf. In this formulation it is shown that a change in bottom relief exerts the following influence on the spatial-temporal parameters of shelf waves with a group velocity equal to zero: an increase in shelf width results in an increase in length, phase velocity and maximal frequency of waves of the first mode; an increase in slope width exerts a lesser influence: the length increases, phase velocity changes insignificantly and maximal frequency decreases. For waves of the second mode an increase in width of the region of variable depths results in the length increasing more rapidly than phase velocity and therefore the maximal frequency decreases. Under conditions of a mean current propagating in a cyclonic direction the group velocity of the shelf waves becomes equal to zero at two points on the dispersion curve. This occurs in a case when $V_{0\ max}$ is less than the phase velocity of the waves which would have a zero group velocity in the absence of a current. If $V_{0\ max}$ is comparable to or greater than the phase velocity of waves with a zero group velocity in the absence of a current, the dispersion curve for shelf waves on the mean current is monotonic (the group velocity in general does not become equal to zero). Figure 1; references 3: 1 Russian, 2 Western.

Frequency of Recurrence of Strong Internal Waves

917N0159A Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 318 No 6, Jun 91 pp 1468-1471

[Article by V. A. Ivanov, Ye. N. Pelinovskiy and T. G. Talipova, Applied Physics Institute, USSR Academy of Sciences, Nizhniy Novgorod]

UDC 551.46

[Abstract] A shipboard echo sounder with a working frequency 169 kHz was used in registry of multihour records of internal waves (IW) on the 39th cruise of the Akademik Vernadskiy while the ship was proceeding on course. This made it possible to investigate fluctuations of the sound scattering layers at depths as great as 150 m, where they are relatively clearly expressed. Fluctuations of the sound scattering layer in the range of periods up to three hours are associated primarily with IW, which correlate with fluctuations of the upper boundary of the thermocline, situated at a depth of 100 m. Such observations were made for a total of 218 hours in the Amazon test range. An effort was made to determine the frequency of recurrence of IW (number of cases of observation of waves with a given height during registry time), a parameter used in prediction theory. Formulas are derived for predicting the frequency of recurrence of

IW. Calculations for the study area were made for one and 10 days, one, three, and six months, one and 10 years. During the time of the experiment one wave with a height more than 31 m should be observed, two with a height more than 28 m and three with a height more than 27 m. In actuality the level 31 m was exceeded three times and the level 27-28 m six times. These and other data were analyzed by extremal statistics methods. The estimates which were obtained are applicable for the Amazon test range as a whole. Figures 3; references 6: 5 Russian, 1 Western.

Characteristics of a Turbulent Spot in a Stratified Ocean

917N0169A Moscow OKEANOLOGIYA in Russian Vol 31 No 3 May-Jun 91 pp 357-362

[Article by R. V. Ozmidov, Shirshov Institute of Oceanology, USSR Academy of Sciences, Moscow]

UDC 551.465.15

[Abstract] Turbulence is not a continuous field, but is formed in spots or zones. Energy considerations and physical models are used to obtain expressions for some characteristics of a turbulent spot in a stratified ocean. The energy released in the generation of turbulence is treated as mixing of a stratified medium, which leads to an increase in the size of the turbulent spot to some limit value. Expressions are obtained for the rate of dissipation of turbulent energy at the spot and for the spot's lifetime. When turbulence is sufficiently intense, the spot may increase isotropically and take the shape of a sphere. The maximum size depends only slightly on energy and the density gradient of the medium. When there is mild stratification and the spot is small, the energy released is small. When a 10 m spot is created in a highly stratified medium, a great deal of energy must be released (up to $8.4X10^3$ J). This latter situation is rare in real conditions. The tables present figures for the kinetic energy needed to form a spot and the dissipation times (from one minute to 10 days) for various spot sizes. The figures presented must be considered preliminary ones as the model does not consider the generation of internal waves, collapse, and the generation of additional turbulent energy due to shift effects, incomplete mixing in the spot, and other factors. Tables 2; references 5 (Russian).

Empirical Orthogonal Functions and the Vertical Structure of Internal Waves

917N0169B Moscow OKEANOLOGIYA in Russian Vol 31 No 3, May-Jun 91 pp 395-399

[Article by V. V. Novotryasov and G. I. Yurasov, Pacific Oceanological Institute, Far East Division, USSR Academy of Sciences, Vladivostok]

UDC 551.465.5

[Abstract] Temperature and salinity fields were measured in the Pacific Ocean. Detailed information about the instrumentation and measurement methods is presented. For analysis the fields were represetned as a series of empirical orthogonal functions. The correlation between the empirical orthogonal functions and the eigenfunctions of the dynamic operator of internal waves was studied. Sufficient criteria were formulated for the existence of a correlation between the two sets of functions. The empirical orthogonal functions were obtained by processing series of vertical soundings of the temperature field of the open ocean. The contribution of internal gravity waves to the empirical orthogonal functions is considered. Figures 3; table 1; references 9: 8 Russian 1 Western.

Structure of Hydrophysical Fields in the Northeast Norwegian Sea

917N0169C Moscow OKEANOLOGIYA in Russian Vol 31 No 3, May-Jun 91 pp 400-405

[Article by N. N. Korchagin, Shirshov Institute of Oceanology, USSR Academy of Sciences, Moscow]

UDC 551.465

[Abstract] Temperature, salinity, and optical measurements were taken in the Norwegian Sea from the surface to the bottom. Nephelometric readings showed the presence of a thick nepheloid layer at the bottom 200-300 m thick. Readings also revealed rapid currents at the surface, at 650 m, and at the bottom, sometimes with speeds exceeding 1.5 m/s. Analysis of current data revealed the existence of a single flow of water from the surface to the bottom in the observation region. The parameters of the bottom turbulent layer were measured. The thickness of the boundary layer was 100 m, the speed of friction, 2.7. cm/s. The spectral characteristics of the vertical inhomogeneities of temperature, salinity, and optical parameters with scales of 1-70 m were analyzed in the main pycnocline layer at 80-820 m. The northeast Norwegian Sea is a region of mixing of warm North Atlantic water and cold polar water. Detailed descriptions of instrumentation and technique are presented. A high correlation was found between the small-scale inhomogeneities of the temperature and salinity fields, indicating that the same type of process is responsible for the formation of both the temperature and salinity fields (for example, internal waves). Figures 3; references 11: 8 Russian 3 Western.

Hybrid Parametric Integral Model of Wind Waves and Its Use

927N0008A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian Vol No 5, May 91 pp 45-50

[G. V. Matushevskiy and I. M. Kabatchenko, State Oceanographic Institute]

UDC 551.466.3.072

[Abstract] Several dozen numerical models are used in oceanography for computing and predicting wind waves in deep water. Although some of these make it possible to trace how waves change in the transformation zone, other zones of wave action have been studied less intensively, primarily without reference to deep-water models. The objective of the study was (with allowance for Soviet and foreign advances and the authors' own experience) formulation of a model of wind waves for the principal manifestations of wave action (for deep and shallow seas, for zones of transformation, surf and runup) conforming to a unified (hybrid) scientific concept and approach. The model is expanded into a series of successive algorithms making it possible to carry out wave computations and predictions. A frequency-integrated equation for the wave energy budget is used in the model. In the case of deep and shallow seas, under simple wave development conditions, the equation is consistent with Soviet and American practice. The pertinent dependencies are generalized for nonstationary-nonuniform development conditions. Friction and refraction effects are taken into account in the transformation zone. Two equations are solved for the surf zone: for wave energy and wave momentum. For the runup zone it is possible to use known computation methods taking into account the irregularity of waves with a correction for the storm position of the waterline. Figures 4; references: 5 Russian.

Propagation of Acoustic Noise in Ocean

927N0018C Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 5, May 91 pp 570-577

[Article by I. P. Tonoyan]

UDC 551.463.2

[Abstract] A study was made of the influence of sound scattering in a water medium on the depth dependence and angular structure of the noise field in the ocean without invoking the simplifying assumptions made in earlier studies in which refraction and the stratification of scatterers with depth were neglected. Theoretical computations and experimental data on the dependence of oceanic noise on depth were compared. An appropriate model was formulated on this basis. The results of numerical computations of the angular structure of the noise field are given with allowance for single and multiple scattering. It is shown that with the scattering of sound on small-scale volumetric inhomogeneities it is possible to limit the study to a single scattering approximation. The proposed model adequately describes the depth dependence. Sound scattering on small-scale inhomogeneities does not result in a substantial change in the depth dependence of oceanic noise. Figures 4; references 12: 11 Russian, 1 Western.

Relationship Between Degree and Spectral Selectivity of Light Extinction in Ocean

927N0018D Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 5, May 91 pp 588-590

[Article by G. S. Karabashev, Atlantic Division, Oceanology Institute, USSR Academy of Sciences]

UDC 551.463.5

[Abstract] The variability of the spectra of the light extinction (LE) index in the ocean is determined by variations of light-scattering suspended matter and colored dissolved suspended matter. Estimates of variations of the spectral properties of the LE index are extremely incomplete because objective characteristics of its spectral selectivity have not been used. Such a characteristic is proposed and its relationship to the LE value in different oceanological situations is determined. The measure of LE selectivity must not be dependent on the concentration of impurities absorbing and scattering light in sea water. The selected characteristic is the relative steepness of the LE spectrum or its selectivity D_i. The variability of D_i was studied using a file of more than 800 LE spectra measured on expeditions with a spectrotransparency meter in samples taken from water layers with different properties. It was found that the dependence of selectivity on the LE value is satisfactorily smoothed by a hyperbolic curve; there are threshold LE values above which selectivity no longer is related to the LE value; in the transparency window of sea water at 470-490 nm there is a sharp change in the nature of the relationship between the degree and selectivity of LE. These regularities are attributable to the fact that the selectivities of light scattering by suspended matter and the absorption of light by dissolved organic matter are different and the contribution of these impurities to LE varies widely in space and with wavelength. For these reasons selectivity was minimal in the Canaries upwelling where there is an abundance of suspended matter and maximal in the depths of the Atlantic where there is little. Figure 1; references: 3 Russian.

Generation of Waves Near the Shore

917N0168B Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 4, Apr 91 pp 463-474

[Article by V. V. Ivanov and V. N. Khramushin, Institute of Marine Geology and Geophysics, USSR Academy of Sciences]

UDC 551.46.6

[Abstract] The surface propagation of waves generated near the shore and their attenuation are examined. Attention is focused on the first wave not reflected from the shore. It is shown that the first wave, which becomes uniform as it propagates (its shape ceases to depend on

distance), and satisfies Stokes equation (the integral of level variations is zero). The wave amplitude along the shore decreases with distance as $x^{-3/4}$, and across the shore, as x^{-1}. The intensity of an asymptotic wave depends on the depth of excitation h_0 as $h_0^{3/4}$. These results are used to study the transoceanic propagation of tsunamis generated by earthquakes and the danger the tsunamis present. It is known that as waves encounter the shore shelf they attenuate, but there has been no method of estimating this attenuation. Such a method is developed in this work. The shore had always been approximated by a straight line, but it is actually a fractal. Analysis of the effect of this fractal on waves with a period of about ten minutes (characteristic of tsunamis) shows that virtually no reflection is observed. A propagation model without reflection qualitatively decribes the observational materials on tsunamis, however, many questions remain aobut the dependence of wave attenuation on distance. Figures 5; tables 2; references 14: 10 Russian 4 Western.

Coherent Structures in Atmospheric Boundary Layer (Review)

927N0007A Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 6, Jun 91 pp 593-613

[Article by L. A. Mikhaylova and A. Ye. Ordanovich, Experimental Meteorology Institute]

UDC 551.551.8

[Abstract] During recent decades new experimental data have been collected on structure of the atmospheric boundary layer. According to these data, in the boundary layer, despite its great turbulence, it is common to observe ordered roll vortices with horizontal axes directed approximately along the mean flow and having scales comparable to the height of the boundary layer. Numerous studies have shown that such ordered vortices are relatively long-lived, concentrate in themselves a considerable part of the turbulent energy and play a decisive role in the transport of heat, moisture and other substances through the boundary layer. The article gives a rather thorough review of the experimental and theoretical research on the characteristics of ordered roll vortices and the conditions for their formation in the boundary layer. The preparation of this review (and critique) was motivated by the fact that the literature has been relatively little generalized, with pertinent articles scattered through countless publications. Particular attention is devoted to cloud streets in the boundary layer, one of the most common types of coherent structures in the atmosphere, for which the greatest number of publications has appeared. The terms "cloud streets," "horizontal longitudinal roll vortices" and "convective bands" are considered synonymous. The literature is reviewed in three sections: I. Visual research on characteristics of ordered cloud formations in atmospheric boundary layer. II. Specialized measurements of characteristics of two-dimensional ordered convection. III. Laboratory experiments and theoretical models of formation of coherent structures in atmospheric boundary layer. Figures 4; references 124: 30 Russian, 94 Western.

Influence of Nonlinearity of Gravity Waves on Characteristics of Radar Signal Scattered by Sea Surface

927N0007B Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 6, Jun 91 pp 659-663

[Article by S. A. Puzenko, Radio Engineering and Electronics Institute, Ukrainian Academy of Sciences]

UDC 551.463.2

[Abstract] A theoretical study was made of some characteristics of a radar signal scattered by waves of a finite amplitude on the surface of a fluid of shallow depth. Nonstationary simple waves and a Korteweg- de Vries soliton were selected as models of such waves. With scattering on a soliton the influence of nonlinearity on the characteristics of the reflected signal was governed by the relationship between the amplitude, width and velocity of the soliton. It is shown that the diffuse component of a field reflected from a soliton, unusual for the Born approximation, is dependent on its amplitude; the Doppler frequency shift of the field scattered on a slightly nonlinear stationary wave is proportional to its amplitude; the nonlinearity of simple waves generating the nonstationarity of sea waves is manifested, for example, in a dependence of the reflected signal on time. These special features of radar sounding of nonlinear sea waves evidently have a rather general character because the nonlinear effects causing them also are characteristic for other types of waves on water. Figures 2; references 7: 6 Russian, 1 Western.

Optical Depth of Clouds Over Ocean

927N0007C Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 6, Jun 91 pp 669-672

[Article by O. A. Yershov, N. M. Levin, I. N. Salganik and S. V. Sheberstov, Oceanology Institute, USSR Academy of Sciences]

UDC 551.576

[Abstract] A method for determining the optical depth (τ) of clouds over the oceans on the basis of measurements of their brightness from the shore or a ship was described in an earlier article by the authors (IZV. AN SSSR: FAO, Vol 24, No 5, pp 539-544, 1988), where τ distributions were given for the coastal zone and the tropical Pacific. These cloud optical depth measurements have been continued on research ships of the Oceanology Institute in the Atlantic Ocean and in the Black Sea. In addition to cloud brightness in cloudless weather with a solar altitude 40-50° and an optical depth of cloudless weather 0.2-0.5, measurements were made of the brightness of a standard screen with a known reflection coefficient. Expressions are derived which in most cases are suitable for determining the optical depth of clouds (other than cirrus). A table and a figure show that clouds over the Atlantic Ocean are appreciably more transparent than in the coastal zone and also somewhat more transparent in the central regions of the ocean in comparison with internal seas (Mediterranean and Black Seas) where cloud formation occurs under the influence of the continent. An empirical distribution function can be used in evaluating the probability of the appearance of clouds with an optical depth not greater than τ_0 at a given point in the world ocean. Figures 2; references: 9 Russian.

Interrelationship Between Atmospheric and Oceanic Thermodynamic Fields in North Atlantic

927N0017A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 6, Jun 91 pp 55-61

[Article by V. V. Yefimov, A. A. Sizov and A. V. Yurovskiy, Marine Hydrophysics Institute]

UDC 551.465.7:551.5(261.1)

[Abstract] Large-scale variations in circulation indices in the North Atlantic ΔP_W and ΔP_T, determining westerly transport in the temperate latitudes and easterly transport in the tropical latitudes, are manifested quasisynchronously. This gives rise to conditions for corresponding large-scale variations in circulation of water masses in the subtropical vortex. An indirect confirmation of intensification (weakening) of circulation in the subtropical vortex with an increase (decrease) in ΔP_W is an increase (decrease) in heat content at its center (Sargasso Sea) and southward (northward) shifting of the northern boundary of the Gulf Stream in the neighborhood of Cape Hatteras. Synchronously with these processes, in the subtropical vortex in the western part of the Tropical Atlantic Energy Active Zone with a strengthening (weakening) of ΔP_W there is a "cooling" ("heating") of the upper 200-m layer of the ocean with a simultaneous increase (decrease) in cloud cover in this region. As a result of synchronization of large-scale variability of circulation in the boundary layers of the atmosphere and the ocean in the North Atlantic with an increase (decrease) in ΔP_W over the European USSR there is a weakening (intensification) of cyclonic activity, and as a result, a decrease (increase) in the quantity of precipitation in the southern European USSR. Figures 2; references 12: 10 Russian, 2 Western.

Use of False-Color Method in Remote Atmospheric Research

927N0010A Moscow ISSLEDOVANIYE ZEMLI IZ KOSMOSA in Russian No 3, May-Jun 91 pp 3-7

[Article by V. V. Kozoderov, Sh. A. Akhmedov and S. A. Veysova, Computation Mathematics Section, USSR Academy of Sciences, Moscow; Space Research Scientific Production Association, Baku]

UDC 551.521:551.550

[Abstract] Since the development of methods for parametrization of the optical effects of aerosol is possible only by obtaining much more information on the microphysical (and other) properties of global aerosol, the finding of microphysical characteristics from information present in scattered light is one of the timely problems in the optics of turbid media. The objective of the study was the testing of a method, quite convenient for engineering computations, which makes it possible to determine the microphysical characteristics of aerosol. The concentration of aerosol particles in the atmosphere was determined from the spectral transparency and scattering phase function using the false-color method. Tabulated values of the zonal functions were used in solving inverse problems. The concentration of aerosol particles was estimated using known values of the polydisperse coefficients and aerosol scattering phase functions. The concentrations of aerosol particles over the Caspian Sea obtained by the false-color method correspond to surface measurements in the error range +/-15 percent. In the absence of contact surface measurements of the quantity of aerosols the false-color method can therefore be used effectively in remote measurements of the propagation of radiation in a turbid medium. References: 6 Russian.

Determining Aerosol Light Backscattering Phase Functions in Atmospheric Correction of Aerospace Measurements

927N0010B Moscow ISSLEDOVANIYE ZEMLI IZ KOSMOSA in Russian No 3, May-Jun 91 pp 8-13

[Article by V. A. Smerkalov, Applied Geophysics Institute imeni Ye. K. Fedorov, Moscow]

UDC 528.813:551.521

[Abstract] One of the difficulties in solving the atmospheric correction problem is the lack of necessary data on vertically averaged aerosol light backscattering phase functions. One of the approaches to solving this problem is the use of aerosol phase functions obtained by inversion of sky brightness phase functions measured from the surface, a method proposed by the author as early as 1983. Since it was discovered that in the case of high surface albedos the errors in this method may increase, procedures were introduced in 1987 to rectify this shortcoming, thereby making it possible to increase the inversion accuracy appreciably and broaden the limits of applicability of the reworked method. Analytical expressions (formulas (4)-(5) are now derived for approximating the statistical dependence of the aerosol light backscattering phase function in the range of angles $90° \leq \theta \leq 160°$ on the refractive index of aerosol particles and the Angstrom index, characterizing the spectral behavior of the scattering coefficients (optical depths) of aerosol. The error from use of the key formulas results in errors in the atmospheric correction of space measurements not exceeding 1-2 percent. During recent years databanks have been organized at research organizations containing information on the predominant refractive indices of aerosol particles and the spectral behavior of optical layers (Angstrom index) under different climatic conditions as a function of type of aerosol, relative humidity, synoptic situation, etc. This to a considerable degree facilitates use of formulas (4)-(5) when carrying out correction of space sounding data. References: 13 Russian.

Increasing Efficiency of Radiometric Correction of Data From Multichannel Scanning System

927N0010C Moscow ISSLEDOVANIYE ZEMLI IZ KOSMOSA in Russian No 3, May-Jun 91 pp 33-38

[Article by A. A. Feoktistov and V. S. Artemkov, AIUS-Agricultural Resources All-Union Scientific Research Center, Moscow]

UDC 528.75:681.32

[Abstract] A new method for improving the results of automated thematic processing is described which involves evaluation of the parameters of residual angular drift of spectral signals remaining after carrying out radiometric correction of data registered in the visible and near-IR spectral ranges by an airborne multichannel scanning system. For example, in the case of statistical inhomogeneity of the processed images in the statistical evaluation of mean intensity errors will appear which lead to a residual "skew" of spectral signatures (their dependence on scanning angle). Additional errors arise because the spectral signatures of different thematic classes have a differing dependence on the scanning angle. There has been a need for further increase in the accuracy characteristics of classification processing. This requires solution of the problem of evaluating the parameters of the angular dependence of the signatures of each thematic class using data which have been subjected to radiometric correction, with the resulting data being used in automated processing. When making an areal survey there are always relatively narrow bands of overlapping which are photographed twice on adjacent flight lines at greatly differing scanning angles. By computing the differences in radiation intensity for the very same features using two scanning angles it is possible to estimate the angular drift of the spectral signatures of each spectral class. Two procedures, automatic and interactive, are proposed for computing the difference in intensities of radiation registered from the very same features using the AMSS. The interactive procedure is more effective. As the level of geometrical distortions is reduced the role of the automatic method may increase considerably. References: 8 Russian.

Radiation Density Distribution in Homogeneous Cloud Layer

927N0018A Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 5, May 91 pp 532-539

[Article by I. S. Gusev and S. V. Dvoryashin, Atmospheric Physics Institute, USSR Academy of Sciences]

UDC 551.521.31:551.576

[Abstract] The vertical distribution of radiation density in a homogeneous cloud layer was simulated by the Monte-Carlo method. The spatial configuration of the density field was constructed. It was found that the maximum of radiation density in the transmitted flux falls in the middle of the cloud layer and has virtually no dependence on absorption. In the reflected flux the density maximum is observed near the upper boundary of the cloud layer, the closer to it the greater the absorption. The distribution of radiation density was determined as a function of the angles of incidence of photons on a cloud layer and the angles of escape of photons from it. The results of computations for a single-layer cloud cover can be used in easily constructing the density distribution for a cloud system consisting of two or more layers. Separate computations were made for a case when a slightly scattering layer (aerosol, cirrus clouds) is situated above or below the cloud layer. The presence of such a layer increases the radiation density in the cloud layer but does not change the position of the density maximum. In a case when the slightly scattering layer is situated above a cloud the radiation flux incident on it becomes slightly diffuse. The results are represented in three-dimensional form in a series of figures. Figures 6; references: 8 Russian.

Relationship Between Scattering Cross Section of Radar Signal and Dynamic Velocity in Air

927N0018B Moscow IZVESTIYA AKADEMII NAUK SSSR: FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 5, May 91 pp 540-544

[Article by S. A. Grodskiy, Marine Hydrophysics Institute, Ukrainian Academy of Sciences]

UDC 551.501.8

[Abstract] The scatterometric method for retrieving wind speed W over the ocean is based on the use of empirical interrelationships between the scattering section of a radar signal (σ) and W; W(z) is the wind measured at a definite height. There is basis for assuming that σ more likely is a function of u_* (dynamic velocity in the air) than W(z); $\sigma = f(u_*)$. Empirical data on $\sigma = f(W)$ were used in finding the dependence of σ on the stability parameter and a quantitative comparison was made of the observed and computed σ changes caused by stratification effects. The objective was to check the hypothesis $\sigma = f(u_*)$ on the basis of radar measurements made from pile bases published in the literature. The data used were for the X (3 cm) and C (5.7 cm) ranges. The conclusion is drawn that in the case of moderate winds σ is a function only of u_*. However, it is recommended that additional σ measurements be made with direct determination of u_* by the pulsation method since this would make it possible to confirm or refute that σ is a function only of dynamic velocity. Figure 1; references: 11 Russian.

Possibility of Varying Relative Intensity of Light Diffraction Pattern Bands From Screen

927N0014A Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 462-467

[Article by Yu. I. Terentyev, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 535.4

[Abstract] This is essentially a continuation of earlier work by the same author (OPTIKA ATMOSFERY, Vol 2, No 11, pp 1141-1146, 1147-1153, 1989; Vol 4, No 4, pp 353-362, 1991), giving a quantitative description of the diffraction pattern from a screen on the basis of interference of edge rays with directly transmitted light. It is clear that if the Huygens-Fresnel principle was correct, with constant parameters of the diffraction scheme, intensity of the incident light and width of the open part of the wave front, it would be impossible to vary the intensity of the diffraction bands, but experience indicates otherwise. Methods for varying intensity follow from Junge concepts on the nature of light diffraction. There is an enhancement of the intensity of edge rays interfering with directly transmitted rays by superposing on the latter edge rays initially propagating in the shadow region. The diffraction pattern from a screen under such conditions is analyzed in detail. It is demonstrated that simultaneously with enhancement of the diffraction maxima there is a weakening of illumination in the region of the geometrical shadow of the screen and vice versa. Figures 3; references: 4 Russian.

Airfield Runway Visibility Range in Fog

927N0014B Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 468-474

[Article by V. Kh. Brikenshteyn, A. S. Drofa, A. A. Shuvalov and L. I. Yakushkina, Tayfun Scientific Research Association, Obninsk; Aviation Equipment Scientific Research Institute, Zhukovskiy-2, Moscow Oblast]

UDC 551.521.3

[Abstract] Computed data are given on the image of a runway observed by a pilot when landing an aircraft in the fog. The computations were made using the theory of linear systems for describing image transfer through light-scattering media. The computations show that the range of runway visibility in a fog is more than twice as great as follows from the presently used theory of visibility, which does not take into account the additional contribution of scattered light from the observed object to its image brightness. The influence of light scattered from the observed object on its range of visibility is demonstrated in the theoretically simple case when the scattering medium and the conditions for its illumination are uniform over the entire area. However, in an inhomogeneous medium, and also with nonuniform conditions of its illumination (caused by inhomogeneity of the medium itself, the influence of surface albedo, and solar altitude above the horizon) the considered factor also may exert a substantial effect and failure to make allowance for this factor in computations of the visibility range may lead to greatly understated results. Figure 1; references 9: 7 Russian, 2 Western.

Statistical Characteristics of Brightness of Radiation Reflected by 'Atmosphere-Earth's Surface' System

927N0014C Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 475-481

[Article by A. N. Valentyuk, Physics Institute, Belorussian Academy of Sciences, Mogilev]

UDC 535.531.535:36

[Abstract] The statistical characteristics of fluctuations of the brightness of radiation reflected by the Earth's surface and atmosphere are governed by the operation of many factors, such as a stochastic change in the optical properties of atmospheric aerosol in time and space, presence of cumulus clouds in the atmosphere and unevenness of local relief. Methods are proposed for computing the mean values and correlation functions of brightness of reflected radiation with allowance for all these factors. The magnitude of the relative brightness fluctuations decreases with a decrease in the angular scale of surface fluctuations and the degree of elongation of the scattering phase function. With an increase in V_f (relative fluctuations of the function f(p)) the V_u value (relative fluctuations of coefficient of diffuse transmission of cloud layer) increases monotonically. The physical interpretation of these dependencies is quite evident and related to the scattering of light reflected from the surface of the cloud medium. It is clear that with a decrease in the angular scale of surface inhomogeneities and elongation of the scattering phase function the "blurring" of the images of surface elements will increase as a result of scattering, whereas the brightness dispersion will decrease. Figures 2; references: 12 Russian.

Formation of Holographic Shear Interferograms in Diffusely Scattered Fields for Checking Telescopic Optical System

927N0014D Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 482-490

[Article by V. G. Gusev, Tomsk State University imeni V. V. Kuybyshev]

UDC 778.38

[Abstract] A shear interferometer based on two-exposure registry of the hologram of the image of a diffuse screen focused by a Kepler telescopic system is described and analyzed. It is shown both experimentally and theoretically that with spatial filtering in the hologram plane it is possible to check the telescopic system over the field of view. Spatial filtering in the Fourier plane ensures registry of the interference pattern characterizing the phase distortions of the wave illuminating the diffuse screen and the reference wave due to the aberrations of the optical systems forming them. In diffusely scattered fields, on the basis of such a two-exposure hologram record of the focused image of a diffuse screen, the shear

interference patterns are localized in the hologram plane and in the distant diffraction zone. The use of spatial filtering in the hologram plane makes it possible to discriminate shear interferograms in the region of overlapping of the images of the telescope exit pupil characterizing its wave aberrations. The phase distortions of the wave illuminating a diffuse screen and the reference wave, due to the aberrations of the optical systems forming them, do not result in any change in the form of the filtered interference patterns. Figures 4; references 11: 9 Russian, 2 Western.

Optoacoustic Detection of Trace Concentrations of CH_3OH, CH_3CN, SO_2

927N0014E Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 497-500

[Article by A. Ye. Bakarev, Ye. N. Bondarchuk, V. N. Razvalyayev and A. M. Sinyukov, Automation and Electrometry Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk; Thermophysics Institute, Siberian Department, USSR Academy of Sciences, Novosibirsk]

UDC 535.343.543.422

[Abstract] The design of a simple, compact optoacoustic detector with a Helmholtz resonator for monitoring smoke effluent from industrial plants, thermal electric power plants, etc. is described. This apparatus is meant to replace chemical or optical detectors with a thermal radiation source, which have serious shortcomings. Particular attention is given to reducing sensitivity of the new instrument to external vibrations and acoustic noise. Measurement data are given on the frequency and phase characteristics of such an optoacoustic detector registered at a pressure 0.5 mm Hg of pure CH_3OH in the line 9P(16) of a CO_2 laser, the steepness of volt-watt characteristics in pure CH_3OH and with dilution of CH_3OH by the atmosphere. The threshold and concentration response of the spectrophone are estimated. The value $C_{min} = 2.9 \times 10^{-6}$ was obtained for CH_3OH, CO_2 laser line 9P(16) and $C_{min} = 5.8 \times 10^{-4}$ for SO_2, CO_2 laser line 9R(18). The results of measurement of collisional broadening of the absorption lines of the CH_3OH, CH_3CN and SO_2 molecules are presented. The values for each of these were determined. The proposed optoacoustic detector, simple, compact and with good noise immunity, can be used as a detector of atmospheric pollution and as a laser spectrometer. Figures 5; references 9: 8 Russian, 1 Western.

Determining Atmospheric Parameters From Surface Differential Refraction Observations

927N0014F Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 506-509

[Article by V. P. Yakubov, Siberian Physical Technical Institute imeni V. D. Kuznetsov, Tomsk]

UDC 528.022:537.874

[Abstract] A new method is proposed for retrieving the surface value of the refractive index and its gradient using data on the derivative of the refraction angle. For obtaining the latter it is proposed that pertinent data be registered using surface observations of the figure of the solar or lunar disks with a change in their position in the heavens. Measurements of the relative difference in the vertical and horizontal dimensions of the disk determine the derivative of the refraction angle and make it unnecessary to use a priori information on the anticipated position of the radiation source. Although the surface observations are easily made, the retrieval of atmospheric parameters cannot be reduced to a simple Abele transform. Accordingly, after retrieval of the refractive index and its gradient an equation is written for the inverse problem. The proposed method for measuring atmospheric parameters from surface observations of distortion of the figure of the solar or lunar disk can be used widely in ongoing monitoring of state of the atmosphere. Measurements of the refractive shift of the relative position of stars in the sky also can be used for obtaining initial differential data. Figure 1; references 14: 13 Russian, 1 Western.

Accuracy in Spectrophotometric Method for Measuring Optical Constants of Dispersed Matter in Visible Spectral Region

927N0014G Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 5, May 91 pp 510-514

[Article by P. K. Khripunov, V. A. Maslov and T. I. Danilova, Central Asian Engineering Center; Stromekologiya Scientific Production Association; Tajik State University imeni V. I. Lenin]

UDC 535.434;551.593;535.36

[Abstract] In the case of a finely dispersed state of matter traditional methods for measuring the values of the refractive and absorption indices, based on interaction between electromagnetic radiation and monolithic matter and involving registry of change in the intensity or direction of the radiation flux after interaction, are inapplicable. The immersion method is proposed as an alternative solution. In earlier work along these lines (P. K. Khripunov, et al., OPTIKA ATMOSFERY, No 4, pp 439-444, 1991, and elsewhere) a spectrophotometric method was developed for measuring the refractive index of larger polydisperse particles in the visible spectral region. Continuing such work, this article gives an analysis of the observed effects by computations based on the Mie theory. The possibilities and accuracy of the immersion method, already employed for determining the refractive index of dispersed matter, were evaluated using the same optical media employed in earlier work. BS-4 glass (a colorless glass) and PC-7 (a purple glass) were selected; the significant difference in their optical properties made it possible to evaluate the accuracy of

the immersion method under highly differing conditions. Glass particles were ground to a size 1-10 μm, made part of a uniform suspension and transmission measurements were made in the suspension using a Specord UV-VIS spectrophotometer. The results of computations of the extinction index of immersion particles as a function of the difference between the refractive indices of the fluid and particles and the value of the absorption index of particles are presented and it is shown that with adherence to specific conditions the immersion method can provide a good accuracy in determining the absorption index. Figures 2; references: 5 Russian.

Experience in Using GARP Level II-c Archives for Evaluating Characteristics of Cloud Fields of Mesometeorological Scale

927N0015A Moscow METEOROLOGIYA I GIDROLOGIYA in Russian No 5, May 91 pp 100-102

[Article by S. N. Moseyeva, Moscow State University]

UDC 551.506.24:551.576(267.37+540)

[Abstract] Estimates were made of the horizontal characteristics of cloud cover in formations of a mesometeorological scale over the Arabian Sea and part of the Indian subcontinent in June-July 1979, taking in the premonsoonal and monsoonal periods. The study was based on data for square 14 of the global archives of cloud cover for level II-c in the GARP program based on satellite IR and TV images. The active monsoonal phase is characterized by cloud formations with mean linear dimensions close to 700 km. The total area which they occupy is 60-70 percent of the total area of the square. Cloud formations with an area more than 3×10^4 km^2 were observed primarily during the period of the active phase of the monsoon and had only a tendency to a random distribution because their actual dimensions frequently intersected the boundaries of the large square. Their form is very irregular. Cloud formations of lesser extent had a form close to square. Within the investigated square the cloud formations are distributed randomly and are slightly dependent on the synoptic situation. The distribution of the recurrence of the mean maximal altitudes of cloud formations is not dependent on the synoptic situation and is characterized by the presence of three maxima: the first is at an altitude up to 1.5 km, the second is at 4 to 5.5 km and the third is at 10 to 12 km. The nature of the underlying surface (sea, continent) jexerts no specific influence on the mean maximal altitudes of cloud formations. Figures 2; references 5: 3 Russian, 2 Western.

One Possible Type of Convective Instability in the Ocean-Atmosphere System

917N0168A Moscow IZVESTIYA AKADEMII NAUK SSSR. FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 4, Apr 91 pp 408-418

[Article by O. V. Perestenko and L. Kh. Ingel, Institute of Experimental Meteorology]

UDC 551.465.7

[Abstract] This article examines a horizontally-homogeneous system of two stratified nonmixing viscous liquids homogeneously heated from above. This heating from above may cause convective instability when there are certain correlations between the parameters of the two media. A linear instability problem is examined for the case of the ocean-atmosphere system using a simple model of two interacting semirestricted stably stratified media. The Coriolus force, rotation, turbulent exchange, and the possible presence of a heat sink at the water-air interface are considered. The presence of a heat sink does not affect the shortwave mode, but the longwave mode is significantly affected. At certain wavelengths a decrease in the stability of upper layer stratification leads to system stabilization. This study is limited to monotonic instability. It was always thought that this type of instability could occur only when two different media interacted. But it is shown that it is, in principle, possible within one medium (the ocean) at internal interfaces. Figures 4; table 1; references 10: 7 Russian 3 Western

Interannual Variation of Wind Velocity in the Norwegian Energy Active Zone

917N0168C Moscow IZVESTIYA AKADEMII NAUK SSSR. FIZIKA ATMOSFERY I OKEANA in Russian Vol 27 No 4, Apr 91 pp 477-480

[Article by Yu. P. Klebantsov and V. A. Rozhkov, State Oceanographic Institute, Leningrad Division]

UDC 551.555

[Abstract] Wind velocity is one parameter typically used to describe climatic changes in atmospheric circulation. We examine the basic patterns of seasonal and interannual variation in wind velocity using a 13-year series of measurements. The average monthly figures show no clear trend in the 13-year series. The annual pattern shows a definite trend toward an increase in wind velocity in winter and a decrease in summer. The direction of the average monthly shift within a year and from year to year varies, and in individual years there is a clear tendency toward counterclockwise rotation. This cannot be seen in a graph of annual cyclicity, but there is a tendency toward an increase in the range of oscillations within a given year. Within individual months the variability of wind velocity is great. Wind direction stability is found to be about 50 percent. The time series is analyzed as periodically correlated random processes. An additive component of interannual variability in wind velocity is found in the form of a stable vector random process. Regional differences in wind velocity exist, but general trends are observed. Although this work analyzes a rather short period of time (13 years) at only one station, this material permits one to draw preliminary conclusions about climatic variability of wind velocity. The parameters of this model are given on

the basis of analysis of existing in-situ measurements from various weather stations. Figures 3; references 8: 6 Russian 2 Western.

Wind Influence on Optical-Microphysical Characteristics of Haze in Marine Coastal Region

927N0011A Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 339-346

[Article by V. V. Veretennikov, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 551.575.1:551.593.7

[Abstract] Using the inverse problem for spectral coefficients of aerosol extinction of light it was possible to obtain quantitative data on the microstructure of haze in the coastal region of the Black Sea and transformation of its submicron and coarsely disperse fractions as a function of wind speed. It was established that wind speed exerts the greatest influence on the content of particles of the coarsely disperse fraction, for the particular observation conditions constituting 74-88 percent of the total mass of aerosol particles. The results confirm the hypothesis expressed earlier on the role of a coarsely disperse aerosol in the formation of a nonmonotonic dependence of the aerosol extinction coefficient of radiation in the IR spectral region on wind speed. The angular dependencies of the characteristics of light scattering retrieved from microstructural data are indicative of a considerable influence of the wind regime on variations of the small-angle part of the scattering phase function in the visible spectral region. The results can be used in taking into account the variability of optical-microphysical models of haze of sea origin under the influence of the wind regime. Figures 4; 11 references: 9 Russian, 2 Western.

Intensity Fluctuations of Narrow Divergent Laser Beam in Snowfall

927N0011B Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 347-352

[Article by A. F. Zhukov, M. V. Kabanov, R. Sh. Tsvyk, N. A. Vostretsov and N. P. Krivopalov, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 621.375.826:551.578.4

[Abstract] Precipitation actively affects the characteristics of a laser beam, which attenuates considerably due to scattering on precipitation particles. Simultaneously with turbulent fluctuations of the refractive index of air the precipitation particles cause considerable fluctuations of the received signal. The statistics of such fluctuations have not yet been adequately studied in the case of multiple scattering. Research on this problem was carried out using a narrow divergent beam because for it there is a strong dependence of the size of particles when $\tau \geq 0.7$. An LG-38 He-Ne laser (wavelength 0.6328 μm) was employed. The full angle of beam divergence was 5×10^{-4} rad. The laser operated in a quasi-single-mode regime and had a Gaussian distribution of radiation in a section in the source plane. The measurements were made along four paths: 130, 390, 650 and 964 m. It was found that the fluctuations increase and then are saturated with an increase in the optical depth of a snowfall (the "saturation" concept is fully examined). The principal finding in this research was that the intensity fluctuations in a narrow divergent beam during the falling of a snowfall without large flakes do not exceed fluctuations in the turbulent atmosphere without precipitation, in other words, the maximal random noise introduced by precipitation does not exceed that in the turbulent atmosphere in the absence of precipitation. Figures 4; references 16: 12 Russian, 4 Western.

Nature of Dependence of Light Intensity on Beam Axis on Width of Slit Limiting It on Basis of Junge Principle

927N0011C Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 353-362

[Article by Yu. I. Terentyev, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 535.4

[Abstract] In an earlier article (OPTIKA ATMOSFERY, Vol 3, No 9, pp 965-975, 1990) the author examined a quantitative description of the diffraction pattern of light from a slit observed in the region of the geometrical shadow based on the interference of rays diffracting at opposite edges of the screens forming the slit. This became possible due to research on the edge wave by the same author (OPTIKA ATMOSFERY, Vol 2, No 11, pp 1141-1147, 1989). The dependence of the intensity of light on the beam axis on the width of the slit limiting it is attributable to the interference between edge rays and axial rays. Expressions are derived for the half-width of the limiting slit during maxima and minima on the beam axis and intensity which are consistent with experimental data. The conditions responsible for considerable enhancement of intensity variations on the beam axis and change in width of the limiting slit are examined for constant parameters of the scheme and intensity of the incident light. The explanation of the dependence of illumination on the beam axis on the size and position of the aperture limiting it on the basis of Fresnel concepts leads to the assertion that there is nonlinear light propagation. Due to the determination of the real cause of the phenomenon this assertion becomes unconvincing. Figures 3; references: 6 Russian.

Focusing of Partially Coherent Beam on Vertical Path

927N0011D Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 363-367

[Article by V. V. Kolosov and S. I. Sysoyev, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences]

UDC 621.378:(29.33)

[Abstract] A study was made of the propagation on a vertical path of powerful optical radiation which is incident at the input of a nonlinear medium. In the emitter plane it is possible to change the initial focusing of the beam along two mutually perpendicular axes. The objective was to obtain minimal angular divergence in the distant diffraction zone after beam passage through a layer of the nonlinear medium. Simulation was carried out for seasonal models of the atmosphere, especially a summer model, where the temperature characteristic of the standard atmosphere was used as the vertical dependence of atmospheric temperature. For continuous radiation on such paths the decisive influence is exerted by wind thermal nonlinearity. A simple algorithm is proposed for minimizing the angular divergence of a beam on a vertical atmospheric path with allowance for this wind thermal nonlinearity. There is a region of energy parameters of the beam where the focusing, obtained on the basis of the proposed algorithm, makes it possible to determine a level of the angular width of a beam which is close to a minimum. In this case the algorithm operates in a region where optimum focusing gives a substantial gain in comparison with a collimated beam and leads to a lessening of energy transfer efficiency in the region in which even optimal focusing is ineffective. Figure 1; references: 7 Russian.

Sounding Propagation of Laser Beam in Lenticular Medium

927N0011E Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 368-375

[Article by I. P. Lukin, Atmospheric Physics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 534.222

[Abstract] Usually a base system for sounding a lenticular medium requires that the source and receiver of optical radiation be positioned at opposite ends of the measurement path and the optical sounding radiation pass through the investigated medium only once. However, in definite situations it is possible to use a system for sounding a lenticular medium when the source and receiver of optical radiation are positioned at the same end of the measurement path and the optical sounding radiation passes through the investigated medium twice. With application of the latter possibility, the article describes theoretical research on the spatial structure of a laser beam reflected in a lenticular defocusing aberration-free medium from mirror, corner or Lambert reflectors of an arbitrary size. Sounding variants of the following methods were employed for determining the optical characteristics of the investigated medium: thermal lens, mirage effect, overfocusing and image shift. It is shown that the thermal lens and mirage effect methods are applicable only in a case when infinite mirrors or corner reflectors are used for retroreflection. However, methods based on the use of overfocusing and shifts of the sounding beam image (with any size of the mirror), a corner retroreflector or a Lambert surface can be used successfully. References 6: 5 Russian, 1 Western.

Possibility of Use of Lidars in Studying Nitrogen Cycle in Photochemical Smog

927N0011F Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 404-409

[Article by Al. V. Kapitanov, An. V. Kapitanov and N. D. Smirnov, Central Aerological Observatory, Dolgoprudnyy]

UDC 551.508.769

[Abstract] The minimal set of components describing the diurnal cycle of nitrogen oxides in a polluted troposphere was determined: NO, NO_2, NO_3 and O_3. The possibility of spatially resolvable measurements of NO_3 is demonstrated. The necessary parameters of a differential absorption lidar for combined measurements of the concentrations of NO, NO_2, NO_3 and O_3 and the relative distribution of aerosol were determined for the purpose of studying the mechanism of formation of photochemical smog. When carrying out combined measurements for the four mentioned components the maximal sounding range will be limited to the sounding range for NO, about 1 km. The parameters of the lidar apparatus necessary for obtaining the N_{min} values of the investigated components were estimated for L = 1 km. With an effective area of the detector 0.1 m^2 and a pulse repetition rate 20 Hz for sounding NO and O_3 the necessary pulse powers of the output radiation are 5 mJ, for NO_2 30 mJ and for NO_3 10 mJ. The output pulse power of an excimer laser must be about 100 mJ. With the mentioned parameters the time for measuring the concentrations of all four components on a kilometer path with a range resolution 50 m is about 10 min. Figures 4; references 22: 7 Russian, 15 Western.

Power Characteristics of Echo Pulse in Atmospheric Slant Sounding of Foam-Covered Sea Surface

927N0011G Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 417-422

[Article by M. L. Belov and V. M. Orlov, All-Union Marine Fishing and Oceanography Scientific Research Institute, Moscow]

UDC 551.501

[Abstract] The power of an echo pulse in the case of slant laser sounding of a sea surface partially covered with foam is investigated. As in the earlier work of the authors (OPTIKA ATMOSFERY, Vol 2, No 7, p 738, 1990), as a model of a sea surface without foam use is made of a randomly uneven locally mirror surface, and as a model completely covered with foam use is made of two models: a model of a randomly uneven locally Lambert surface and a model of a plane Lambert surface. Analytical expressions are derived for the mean received power, lag and duration of an echo pulse during slant sounding of the sea surface under conditions of a transparent and an optically dense aerosol atmosphere. The presence of foam on the sea surface exerts a strong influence on the strength of the echo signal in all system operating modes (with pulsed and continuous irradiation; monostatic and bistatic sounding; slant sounding and sounding to the nadir). The influence of the foam model on an echo signal is usually manifested only when there is a great speed of the near-water wind and adequately narrow laser beams (when the size of the irradiated spot on the sounded surface becomes comparable to the height of the irregularities). The influence of the atmosphere on the echo signal is complexly dependent on the operating mode of the sounding system and the foam model. In the case of pulsed sounding atmospheric turbidity leads to a sharp decrease in the influence of foam on echo signal shape. Figures 3; references 7: 5 Russian, 2 Western.

Influence of Noise on Statistical Characteristics of Aerosol Lidar Signals

927N0011H Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 432-438

[Article by Yu. S. Balin, I. A. Razenkov and A. P. Rostov, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 555.521.3

[Abstract] A theoretical and experimental study was made of the distorting influence of noise on the coherence spectra and phases of signals of an aerosol lidar. Both correlated and uncorrelated noise were taken into account. A spectral analysis was carried out for a segment of a sounding path examined in the form of a linear system with one input and one output. A "LOZA-3" laser sounder was used in registry of the statistical characteristics of lidar signals in August-September 1988 over an even underlying surface; the lidar path was at an elevation angle 3-5° in the direction of wind speed; lidar signals were registered at 20-m intervals. On the basis of spectral analysis of these data an expression is derived which in the presence of noise makes it possible to obtain an unbiased estimate of wind speed from lidar measurements of the phase spectrum. Specific examples of such processing are given. The use of spectral analysis for statistical processing of lidar data is therefore possible in the frequency region bounded upward by about 0.1 Hz (for the used class of apparatus, for the scales of aerosol inhomogeneities and mean wind observed in the atmosphere). Figures 4; references 10: 9 Russian, 1 Western.

Optimization and Analysis of Efficiency of Adaptive Optical Systems With Multichannel Phase Modulation

927N0011I Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 4, Apr 91 pp 376-386

[Article by V. Ye. Kirakosyants, V. A. Loginov and V. V. Slonov, Astrofizika Scientific Production Association, Moscow]

UDC 621.373.826

[Abstract] In the statistical optimization of information systems and the theory of statistical solutions adaptive optical and multichannel phase modulation systems can be regarded as systems with a partially stipulated structure for which phase modulation is an integral property. Several possible methods which can be used in applying an algorithm for measuring distortions in such systems are discussed, serving as a basis for solving the problem of synthesis and analysis of an optimal algorithm for control of an adaptive optical system. Wave front distortions are evaluated by using multichannel phase modulation of the received signal. The influence of both the background radiation of the atmosphere and noise on signal registry in the detector is taken into account. The efficiency of optimal and suboptimal algorithms is compared for a turbulent atmosphere. It is shown that in the case of a great intensity of modulation an optimal algorithm, not requiring the quite complex procedure of weighted summation of high-frequency signals, can ensure a high efficiency in operation of an adaptive optical system. References: 9 Russian.

Solar Radiation and Radiation Budget at Ocean Surface Determined From Artificial Earth Satellite Observations

917N0158A Moscow ISSLEDOVANIYE ZEMLI IZ KOSMOSA in Russian No 2, Mar-Apr 91 pp 15-25

[Article by N. A. Timofeyev, M. V. Ivanchik and A. I. Sevostyanov, Marine Hydrophysics Institute, Ukrainian Academy of Sciences, Sevastopol]

UDC 372.21.03.21

[Abstract] Algorithms for the registry of on-line information on the total solar radiation flows and the radiation budget at the ice-free ocean surface were used on the 34th, 35th, 37th, 38th and 40th cruises of the Akademik Vernadskiy (1986-1989) using satellite (NOAA) scanner observations in the spectral ranges 0.725-1.1, 10.3-11.3 μm. These data were used in compiling an atlas of maps of total solar radiation Q and the radiation budget R for quite extensive regions of the Atlantic Ocean. The spatial resolution is 0.5 x 0.5° in latitude and longitude; time averaging is from 10 days to a month; the error is not greater than 5 percent. The map isolines are drawn each 1 MJ/(m^2 x day). The Q and R maps were plotted using daytime measurements in the indicated ranges. The computed radiation budget values can be corrected using nighttime measurements in the band 10.3-11.3 μm. In addition to the atlas, information on radiation flows is contained on magnetic tapes. As an example, Q and R maps constructed on the basis of satellite observations on the 40th cruise are reproduced as Figures 5 and 6. Figures 6; references 2: 19 Russian, 4 Western.

Effect of Tropical Cyclones on Thermal Stratification of Tropical Atmosphere Determined From Space Sounding Data

917N0158B Moscow ISSLEDOVANIYE ZEMLI IZ KOSMOSA in Russian No 2, Mar-Apr 91 pp 85-98

[Article by I. V. Pokrovskaya and Ye. A. Sharkov, Space Research Institute, USSR Academy of Sciences, Moscow]

UDC 551.511.61

[Abstract] A statistical model of the thermal gradient field (at three pressure levels) was constructed at spatial scales 500-5000 km with a grid interval 100 km and a temporal variability five days - four months on the basis of a spatial-statistical analysis of thermal soundings of the tropical atmosphere in zones of intensive cyclogenesis. The basic data on the spatial and temporal variability of the thermal state of the tropical atmosphere were collected over the Pacific Ocean during two sharply different synoptic situations: in a "quiet," undisturbed state (in the absence of tropical cyclones) and during the direct passage of a tropical cyclone in this region (10°-25°N, 115°-160°E) during the periods June-September 1985 and October-November 1986. Within the limits of statistical variations it is shown that there is a stable character of the thermal gradients in the middle and upper stratosphere which remains unaffected by tropical disturbances, however surprising this finding may seem. However, if it is taken into account that the thermal stratification of the atmosphere is determined by interaction among components of the radiation budget of the planetary surface-atmosphere-space system with spatial scales exceeding 2000-3000 km and time scales 30-40 days, it is clear that the contribution of an individual cloud mass of a tropical disturbance and its phase sources of heat to the overall thermodynamic stratification is small and virtually indistinguishable against the background of natural spatial variations. Figures 4; references 20: 18 Russian, 2 Western.

Features of Propagation of Short Optical Pulses in Resonantly Absorbing Atmosphere. Part I. Horizontal Paths

917N0163A Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 242-244

[Article by M. V. Kabanov, Yu. V. Kistenev and Yu. N. Ponomarev, Siberian Physical Technical Institute imeni V. D. Kuznetsov, Tomsk; Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 535.23

[Abstract] A study was made of the characteristics of deformation and extinction of short optical pulses of different shape in a resonantly absorbing gas atmosphere during their propagation along horizontal paths at altitudes 0-15 km. The transformation of pulse characteristics in the course of their propagation was analyzed using a system of Maxwell-Bloch equations in the approximation of a small pulse area. A change in absorption line parameters with altitude was taken into account in accordance with their dependence on medium temperature and pressure and standard atmospheric models. Computations revealed that tropospheric transmission for short pulses in the resonance absorption lines changes significantly with altitude only when the key parameter $\mu < 1$. Medium transmission also is determined by the distance from resonance: at the line center a decrease in the γ_L/γ_D value (where γ_D is line Doppler half-width) results in an increase in medium transmission, whereas on the line wing the dependence is the reverse. Figures 5; references 7: 6 Russian, 1 Western.

Features of Propagation of Short Optical Pulses in Resonantly Absorbing Atmosphere. Part II. Slant Paths

917N0163B Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 245-249

[Article by M. V. Kabanov, Yu. V. Kistenev and Yu. N. Ponomarev, Siberian Physical Technical Institute imeni V. D. Kuznetsov, Tomsk; Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 535.23:31:326

[Abstract] The characteristics of deformation and extinction of short optical pulses of different shape in a resonantly absorbing gas atmosphere during their propagation on slant paths were investigated. The atmospheric volume was simulated by a plane-layered inhomogeneous medium whose parameters changed in

accordance with standard statistical models of the atmosphere. The thickness of the atmospheric layer was 10 km. Atmospheric water vapor was regarded as the resonantly absorbing component of the medium. The change in shape, width and central frequency of the absorption line, as well as the water vapor concentration with altitude, were taken into account in the computations. An analysis of transformation of the characteristics of pulses in the course of their propagation was made on the basis of the Maxwell-Bloch equations for a quasiplane wave in the geometrical optics and small pulse area approximations. It is shown that inertial response effects in a resonance medium exert a substantial influence on the propagation process: both the temporal and energy characteristics of the pulse are dependent on the direction of propagation in the inhomogeneous atmosphere. Figures 4; references: 4 Russian.

Spatial Filtering of Interferograms of Lateral Shift in Holographic Interferometry of Focused Image

917N0163C Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 250-260

[Article by V. G. Gusev, Tomsk State University imeni V. V. Kuybyshev]

UDC 778.38

[Abstract] In two earlier studies (OPTIKA ATMOSFERY, Vol 3, No 9, pp 934-945, No 10, pp 1034-1044, 1990), the author, using two-exposure registry of the focused image of a diffusion screen, analyzed methods for obtaining lateral shift interferograms when carrying out spatial filtering of a diffusely scattered field. Provision is made for constructing the image of a diffusion screen in the plane of a photographic plate both by performing two successive Fresnel transforms of the scattered field and by using two successive Fourier transforms. An optical system is used which forms an image in coherent light. This ensures conditions for a constant value of the frequency transfer function of the lens or objective up to a definite value of the maximal spatial frequency. It is shown both theoretically and experimentally that the control of a lens or an objective over the viewing field is ensured by carrying out spatial filtering in the hologram plane. Spatial filtering in the far diffraction zone ensures registry of the interference pattern characterizing the phase distortions of a wave illuminating the diffusion screen due to aberrations of the optical system forming it. Figures 6; references: 9 Russian.

Correlation Function of Intensity of Long-Wave Radiation Under Broken Cloud Cover Conditions: Solution Method

917N0163D Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 286-292

[Article by Ye. I. Kasyanov and G. A. Titov, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 551.521+551.576

[Abstract] In formulas for computing the mean intensity of thermal radiation it has been assumed that the scattering of long-wave radiation in clouds can be neglected. The limits of applicability of this approximation were investigated in an earlier study by the authors (OPTIKA ATMOSFERY, Vol 2, No 2, pp 133-140, 1989) in which they formulated a statistical simulation algorithm for estimating the mean intensity of thermal radiation and a study was made of the influence of the effects of multiple scattering on the formation of the brightness field of long-wave radiation. Proceeding on this basis, the problem is reformulated as follows. It is assumed that except for the cloud field the atmosphere is horizontally homogeneous, is characterized by a stipulated temperature and is in a state of thermodynamic equilibrium. The underlying surface is an ideally black emitter with a given temperature. The optical model of a broken cloud cover is stipulated in specific layers in the form of random scalar fields of the extinction coefficient, probability of survival of a quantum and scattering phase function. In this formulation the stochastic transfer equation is used in deriving a closed system of equations for the correlation function of the intensity of long-wave radiation and methods and algorithms for their solution are developed. References 8: 7 Russian, 1 Western.

Concept and Structure of Information and Software Support for Remote Sensing Data Processing System

917N0163E Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 293-299

[Article by P. E. Belts, V. T. Kalayda and A. V. Kondratyev, Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC 531.521:681.324

[Abstract] This article is devoted to a description of the concept and structure of an automated data system for the processing of multispectral satellite observations. A block diagram of the information system is given and fully discussed. The software which was developed makes possible a unique solution of the problem of interaction between the information system and the user. The proposed information system is open for expansion and adaptation to different types of thematic processing, as well as the possibility of its conversion to another computation medium with minimal expenditures. At the Atmospheric Optics Institute this information system is applied using a YeS-SM computer network and is used in processing multispectral digital and analog satellite data received from satellites of the NOAA and METEOR series. Work is being completed on applying the information system using a YeS-IBM/PC (XT, AT) computer network. Figures 2; references 6: 5 Russian, 1 Western.

Probability of Reception of Pulsed Optical Signals Propagating Through Cloudy Atmosphere

917N0163F Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 3, Mar 91 pp 314-320

[Article by V. Ye. Gorshkov, Yu. G. Grin and N. N. Moiseyev, Moscow Radio Communication Scientific Research Institute]

UDC 621.371

[Abstract] A simple model of an optical communication channel is proposed which includes clouds. The model makes it possible to compute the probability of reception of a pulsed optical signal through the cloud layer and the principal integral characteristics of such a signal. The approximate relations used in the model ensure satisfactory agreement with the results of numerical simulation. In computing the signal-to-noise ratio allowance is made for the mismatching between the spectra of the arriving pulses and the photodetector videoamplifier. The probability of communication is determined from the condition of nonexcess of a stipulated signal-to-noise ratio. The computation algorithm includes a block making it possible to simulate channel stochasticity. The programs which are applied are characterized by a high mobility and the possibility for simple work organization in a dialogue mode. The conditions for the reception of pulsed optical signals are determined for typical parameters of the transmitting-receiving apparatus. Figure 1; references 26: 22 Russian, 4 Western.

Analysis of Dynamic Correction of Atmospheric Aberrations by Flexible Mirrors

917N0162A Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 2, Feb 91 pp 155-160

[Article by K. V. Shishakov and V. I. Shmalgauzen, Moscow State University imeni M. V. Lomonosov]

UDC 535.416.3

[Abstract] One of the methods for increasing the speed of an adaptive optical system under the conditions prevailing in the turbulent atmosphere is improvement in the system for controlling flexible mirrors. An analysis was therefore made of the dynamic correction of atmospheric aberrations by flexible mirrors in adaptive phase conjugation systems, with emphasis on the following: computation of a linear shaping filter for describing the dynamics of phase distortions, choice of a wave front corrector model and synthesis of a suboptimal control by adaptive mirrors. Suboptimal laws of control of mirrors with correction of the phase distortions using the first ten Zernike polynomials are analyzed. Allowance for the spectral functions of correctable atmospheric aberrations makes possible a decrease in the correction error by a factor of approximately 1.5-2. In certain cases it is sufficient to use optimal regulators of stabilization systems. Figures 1; references 14: 12 Russian, 2 Western.

Piecewise-Linear Approximation Method in Phase Front Retrieval for Adaptive Optical Systems

917N0162B Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 2, Feb 91 pp 161-165

[Article by D. A. Bezuglov, Ye. N. Mishchenko and O. V. Serpeninov]

UDC 535.5

[Abstract] Using a piecewise-linear approximation an efficient algorithm is written for retrieving the phase front in adaptive optical systems. The proposed method considerably reduces the volume of computation work and increases the accuracy in retrieval by using the results of measurements with a Hartmann transducer. The method is universal and can be employed using both analog devices and modern high-speed computers. Representation of the phase front in each subaperture in the proposed form makes it possible to use a wave front detector in an adaptive optical system with a segmented mirror with control in both tilt and position. In this case the error in approximating the wave front is decreased by a factor of 2 in comparison with a segmented mirror. When using the proposed method it is unnecessary to carry out inversion of type-G matrices and no difficulties are encountered in solving the retrieval problem for a broad class of response functions for flexible adaptive mirrors. Figures 2; references: 6 Russian.

Retrieving Intensity Distribution of Laser Radiation From Surface Temperature of Sectional Target

917N0162C Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 2, Feb 91 pp 166-172

[Article by V. P. Aksenov, Ye. V. Zakharova and Yu. N. Isayev Atmospheric Optics Institute, Siberian Department, USSR Academy of Sciences, Tomsk]

UDC (535.2+535.241):621.373.8

[Abstract] A solution was found for the problem of retrieving the intensity of laser radiation from the surface temperature of a heated target. The use of a sectional target makes it possible to reduce the multidimensional inverse thermal conductivity problem to a set of one-dimensional problems and temperature inversion formulas are derived for different heating regimes of one-dimensional elements. These measures make it possible to retrieve the heat flow with arbitrary values of the thermophysical parameters. The accuracy characteristics of algorithms for characteristic models of temporal variation of intensity were evaluated and it is shown by numerical experiments that the use of smoothing splines and algorithms not containing differentiation of temperature values increases the accuracy of the retrieved heat flow. Figures 3; references: 11 Russian.

Method for Computing Light Scattering Parameters of Two-Layer Sphere With Inhomogeneous Shell

917N0162D Tomsk OPTIKA ATMOSFERY in Russian Vol 4 No 2, Feb 91 pp 191-196

[Article by V. A. Babenko and S. T. Leyko, Physics Institute imeni B. I. Stepanov, Belorussian Academy of Sciences, Minsk]

UDC 535.36

[Abstract] A method was developed for computing the light scattering characteristics of a two-layer sphere with a homogeneous core and a radially inhomogeneous shell with a power law dependence of the complex refractive index $m = A\rho^b$, where $\rho = 2\pi r/\lambda$ (r is the distance from the center of the particle, λ is wavelength); A, b are arbitrary complex constants. The method is based on a combination of the Gegenbauer addition theorem and expansion into a continuous fraction for Bessel functions and their logarithmic derivatives. The algorithm was applied using a BESM-6 computer. Control computations indicated agreement with the results for degenerate cases presented, for example, by M. Kerker, et al., JOSA, Vol 56, No 8, pp 1053-1056, 1966. A polydisperse variant of the program (lognormal and gamma distributions of the core radius r_1; constant ratio of the external radius r_2 to r_1) was used in investigating the light scattering characteristics of cluster formations and some varieties of atmospheric aerosol. References 17: 10 Russian, 7 Western.

Observability of Initial Conditions for Motion of Artificial Earth Satellites Using Orienting Angles of Space Survey Bases

917N0171A Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOSYEMKA in Russian No 6, Nov-Dec 90 pp 59-67

[Article by T. K. Dedova, graduate student, Moscow Order of Lenin Institute of Geodetic, Aerial Mapping and Cartographic Engineers]

UDC 528.225-629.783

[Abstract] In earlier studies (IZV. VUZov. GEODEZIYA I AEROFOTOSYEMKA, No 5, pp 82-90, 1989; No 3, pp 47-55, 1990) the author investigated the observability of the initial conditions for motion of artificial earth satellites on the basis of measurements of the coordinates of points on the Earth's surface on topographic photographs oriented in inertial space when using collinearity equations. The results obtained are correct for both individual and overlapping adjacent photographs. Continuing the earlier work, the author now investigates the observability of the initial values of the elements of a Keplerian orbit using data obtained from photogrammetric processing of synchronous overlapping photographs of the Earth's surface when using the internal geometrical relationships arising in a Greenwich coordinate system. It is shown that when using rank tests it is impossible to make an unambiguous determination of the initial values of the orbital elements when applying the coplanarity condition. However, it is demonstrated that it is possible to obtain an unambiguous refinement of the initial values of all six elements of a Keplerian orbit when using the orienting angles of space survey bases as the measurements. References: 5 Russian.

Stereophotogrammetric Method for Mapping of Shallow-Water Zones of Shelf Using Aerial Photographs

917N0171B Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOSYEMKA in Russian No 6, Nov-Dec 91 pp 73-76

[Article by A. P. Mikhaylov, docent, candidate of technical sciences, Moscow Order of Lenin Institute of Geodetic, Aerial Mapping and Cartographic Engineers]

UDC 528.9:528.7

[Abstract] The theoretical principles of a stereophotogrammetric method for mapping the shelf from aerial photographs are examined. In order to determine the coordinates and depths of sea floor points it is sufficient to measure the coordinates of corresponding images of these points on a pair of photographs and employ the known values of the elements of inner and outer orientation and the value of the refractive index to compute the values of bottom point coordinates. The principal problem in processing of aerial photographs of the shelf floor is determination of the elements of outer orientation. Several variants can be proposed for their determination, depending on survey conditions. When mapping coastal zones of the shelf, when there is an image of the land on the stereopair, there are two possible variants. If on the stereopair the land occupies more than 25-40 percent of the total area, these elements are found by the method of double reverse photogrammetric intersection using control points on the land surface. If the land occupies less than 25 percent of the stereopair, as the vertical control points use is made of not less than one buoy situated at the edge of the photograph. If there is no image of land on the stereopair, in the survey it is necessary to use a radiogeodetic system for determining the plane coordinates of photographed points and an altimeter for determining the elevation of photographed points relative to the sea surface. In this case for determining the angular elements of outer orientation it is sufficient to use as vertical control points not less than three buoys situated in the corners of the stereopair. Collinearity equations are used in determining the angular elements of outer orientation. Figures 2.

Automated Interpretation of Photographs in Aerospace Training of Natural Scientists at Institutions of Higher Education

917N0171C Moscow IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: GEODEZIYA I AEROFOTOSYEMKA in Russian No 6, Nov-Dec 90 pp 82-89

[Article by Yu. F. Knizhnikov, doctor of geographical sciences, V. I. Kravtsova, doctor of geographical sciences, and I. K. Lure, candidate of geographical sciences, Moscow State University imeni M. V. Lomonosov]

UDC 528.77

[Abstract] A course on aerospace research methods is being taught at 35 universities and colleges in the USSR and efforts are being made to ensure that the specialists in the earth sciences being prepared there are receiving quality uniform training with full attention to the state of the art, particularly with respect to computer training. The need for coordination of work in this direction among different institutions and among different fields of specialization is stressed. The teaching of the automated processing of photographs is based on the proper combination of hardware, software and images on computer media and accordingly the appropriate types of hardware and software for such computer processing are discussed. Students must receive not less than 200 hours of actual on-hands training and a specific comprehensive program of two-hour exercises for this purpose is outlined. Experience in such training of geographers using a digital display system constituting part of an academic scientific system for the automated interpretation of aerospace images in the Geography Faculty at Moscow State University is described. It is emphasized that the continuing appearance of new generations of computers dictates that those now in training have a solid basis of knowledge and skills adequate for exploiting future capabilities of processing systems. References: 4 Russian.

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